

differences in the satellite-to-user link. Unfortunately for LQSS, such antennas hardly are innovative; they generally are described by Messrs. Jasik and Johnson in their Antenna Engineering Handbook (2nd Edition). Moreover, the MARECS GSO spacecraft and the ERS-1 LEO satellites currently employ similar antennas.^{23/}

The most significant defect in LQSS' use of these antennas is with Globalstar System B. LQSS' application presents the antenna contour for each beam on a separate page so that their interactions are not readily observed. However, when the beam contours are examined together, it can be seen there is considerable overlap. In fact, in some parts of the coverage of one beam the adjacent beam will have a higher gain. This would, of course, increase the intrasystem interference considerably for System B users in those parts of the overlapping coverage.^{24/} LQSS never mentions this problem in its application, nor do the entries for "Intra/Interbeam Interference" in the System B link budgets indicate adequate consideration of these worst-case

^{23/} These antennas are claimed to be designed to compensate for the difference in the satellite-to-user link losses between the "near" and the "far" users, so that the power flux density of the "far" users is about the same as that of the "near" users. This antenna design is intended to reduce the near-far problem experienced by many cellular-type systems, reduce harmful interference and increase capacity. The service link beams generated by the Globalstar antenna are long narrow and ellipse-like, resembling bananas, with the major axis of the ellipse in the direction of satellite travel. According to the antenna patterns in the Globalstar applications these beams have maximum gains near the end of each "ellipse" (where the path lengths are longer) and gradually decreasing gains along the major axis of the ellipse until the intersection of the minor axis is reached.

^{24/} This is not a problem for System A because it employs beam-hopping and adjacent beams are not illuminated at the same time.

situations. The effect of this additional interbeam interference is that the claimed capacity of Globalstar System B is considerably overstated.

Another antenna problem for both Globalstar systems is that while the gain increases from the intersection of the ellipse axes outwards along the major axis --- it decreases in the direction perpendicular to the major axis of the ellipse. In other words, in a direction perpendicular to the direction of movement of the satellite, the Globalstar antenna aggravates the near-far problem. While this change in gain can be compensated for by individual channel power control, use of power for this purpose decreases the amount available to overcome vegetative shadowing.

Lastly, the Commission also must question the technical feasibility of LQSS's proposed system design due to its apparent failure adequately to take into account the adverse effects of intersatellite interference and its "keep alive" functions.^{25/}

d. Constellation's Aries System

Constellation's pioneer's preference request is equally lacking in any innovative technological or service proposals. It states, only in the most general terms, that its proposed system will be comprised of "several unique and dynamic technologies," including an innovative micro-satellite, dynamic receivers and a

^{25/} See Motorola's Reply Comments (Jan. 31, 1992); Motorola's Consolidated Response (Mar. 27, 1992).

new launch vehicle.^{26/} No specific design features are identified either in Constellation's preference request of its application. Furthermore, it appears that many of these features are still in their early development stage. Moreover, none of the services that Constellation has identified can legitimately be characterized as new or innovative. Finally, Constellation has proposed a frequency assignment scheme whereby all of the RDSS applicants would be authorized to operate in as little as 2 MHz of L-band spectrum. In Motorola's view, this scheme simply is unworkable as a business solution and Constellation should receive no credit for having proposed it.

e. Celsat's Hybrid System

Celsat's request for a pioneer's preference is unique in that it repeatedly references an application that, insofar as is known, has not been filed with the Commission. Celsat makes many claims as to the performance of its proposed system which it claims justify a pioneer's preference. Absent a comprehensive system application setting forth the basic parameters of its proposed system, it is impossible for the Commission and other interested parties to evaluate the claimed innovations and technical feasibility of Celstar. Moreover, Celsat never identifies the specific technologies that it believes deserve a

^{26/} See Request for Pioneer's Preference of Constellation, File No. PP-29, at 5 (Feb. 20, 1992). The Commission has already rejected claimed innovative launch technologies as not within the class of innovations for which the pioneer's preference was meant to include. See Tentative Decision, at ¶ 17.

pioneer's preference. In this regard, the cornerstones of the Celstar system -- large aperture, multi-beam satellite antennas and CDMA -- are well-known and certainly not innovative.

B. Only Motorola Has Demonstrated the Technical Feasibility of its Proposed LEO System Innovations

1. Motorola is the Only Applicant That Has Conducted Field Tests of its System

Motorola is the only applicant that can be credited for conducting propagation experiments in support of its request for a pioneer's preference.^{27/} While these tests are still in progress, Motorola is able to provide the Commission with preliminary results. Among other things, these preliminary results confirm the IRIDIUM™ system's design characteristics under adverse propagation conditions. Thus, burst communication of voice packets have been shown to permit link closure under time varying fading conditions. This burst interval must exceed the expected duration of fades exceeding system threshold. Moreover, the use of efficient Vocoder/Error Correction Schemes yields additional, equivalent link margins in excess of the baseline system margin.

^{27/} These experiments are being conducted pursuant to Special Temporary Authority. See Request for Pioneer's Preference of Motorola, File No. PP-32, Exhibits (July 30, 1991). Motorola also has pending experimental license applications to conduct more extensive testing of many of the components of the IRIDIUM™ system. These tests will be performed in four phases, culminating in an in-orbit testing of several prototype satellites.

Motorola has also demonstrated by a combination of analysis and simulation that the IRIDIUM™ system will provide reliable communications even in environments of heavy shadowing by trees, multipath caused by reflecting surfaces, and inside vehicles without the use of external antennas. These results are based significantly upon propagation data collected since 1990 and are ongoing.

In addition, Motorola has conducted voice and data simulations of key components of its system design. For example, Motorola has performed various demonstrations of speech communications over the IRIDIUM™ system in heavily shadowed propagation conditions. These simulations further support the technical feasibility of the system design.

2. Other Evidence of the Technical Feasibility of the IRIDIUM™ System

Motorola's comprehensive system application provides additional support as to the technical feasibility of the IRIDIUM™ system and the innovations contained therein. This application also describes, in detail, the services to be provided over the IRIDIUM™ system, Motorola's plan for implementing these services, the frequencies it proposes to use for its user, feeder and intersatellite links, the areas of service coverage, and the conflicting RDSS licensing rules, all in accordance with Section 1.402(a) of the Rules.

Moreover, Motorola commissioned an independent "Red Team" in the Summer of 1990 to critically review the technical

feasibility of the IRIDIUM™ system design. This Red Team was led by a senior engineer formerly of Comsat Laboratories and was comprised of technical experts from Comsat Laboratories. These experts concluded that the IRIDIUM™ system is technically feasible. This Red Team continued to offer their critical review through the system concept review in September 1990 and the preliminary design review in January/February 1991. They also have been called upon as needed to offer critical comment as the design continues to progress. Subsequently, potential international investors in the Spring of 1991 commissioned Comsat General (California) to evaluate the feasibility of the IRIDIUM™ space vehicle design. Their conclusion again validated the feasibility of the technical design.

V. A NATIONWIDE PREFERENCE IS WARRANTED

Although the Commission indicated that it generally was not in favor of granting nationwide preferences,^{28/} in this case a nationwide geographic preference is warranted. All of the parties have requested such a preference. LEO systems inherently are not limited to small geographic areas, with several applicants, including Motorola, proposing global systems. Indeed, the Commission has observed, that "[w]here a service area

^{28/} See Report and Order, 6 FCC Rcd. at 3495.

is inherently nationwide, we will consider granting a nationwide preference."^{29/}

Nor would the award of a preference to Motorola result in a nationwide monopoly. As Motorola previously has demonstrated in related RDSS licensing proceedings, other LEO applicants could be authorized in the remaining two-thirds of the RDSS bands that the IRIDIUM™ system will not operate in.^{30/} Motorola encourages the Commission to grant other competitive systems, as it has so successfully done for terrestrial cellular systems.

^{29/} Id. The Commission apparently granted VITA a nationwide preference for its LEO system below 1 GHz. See Tentative Decision, at ¶ 22.


^{30/} See Reply Comments (Jan. 31, 1992).

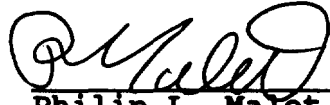
VI. CONCLUSION

For the foregoing reasons, the Commission should grant Motorola's request for a pioneer's preference and deny the requests of all of the other parties to this proceeding.

Respectfully submitted,

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April 8, 1992

DECLARATION

I, Raymond J. Leopold, hereby declare under penalty of perjury that I have either prepared or reviewed the materials and information set forth in the foregoing Comments submitted by Motorola Satellite Communications, Inc. in the Commission's pioneer's preference proceeding for satellites operating in the RDSS bands; and, that said information and materials contained therein are true and correct to the best of my knowledge, information and belief.

A handwritten signature in black ink, appearing to read "Raymond J. Leopold", is written over a horizontal line.

Raymond J. Leopold
Chief Engineer
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Date: APRIL 8, 1992

CERTIFICATE OF SERVICE

I, Philip L. Malet, hereby certify that the copies of the foregoing Comments were served by first-class mail, postage prepaid, this 8th day of April, 1992, on the following persons:

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